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Title:

Probabilistic Aspects of Clathrin-Mediated Synaptic Membrane Activity

Abstract:

Clathrin-mediated endocytosis (CME) plays an important role in the overall regulation of chemically mediated neural communication. After synaptic vesicles fuse with regions of plasma membrane, excess membrane that has been delivered to pre-synaptic nerve terminals is recycled. Correspondingly, in postsynaptic target cells, surface-expressed molecules such as NMDA receptors are directed away from the membrane into specific endocytic pathways. CME is central to these and other associated trafficking events. Studies of tissue culture models of receptor-mediated endocytosis, such as those involving the transferrin receptor, indicate that productive clathrin-coated pits (those which result in coated vesicles) arise via stochastic processes. We recently derived analytical equations that link the fate probabilities of coated pits to various system parameters, including the elasticity coefficients of vesicle membranes and protein coats, stabilizing energies of coat formation, cellular concentrations of pit components, and energies associated with the binding of endocytic cargo. These results are discussed in relation to several aspects of synaptic activity.